

(12) UK Patent Application (19) GB (11) 2 266 482 (13) A
(43) Date of A publication 03.11.1993

(21) Application No 9214683.6

(22) Date of filing 10.07.1992

(30) Priority data

(31) 92196775

(32) 02.05.1992

(33) GB

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(51) INT CL⁵

B21D 15/06

(52) UK CL (Edition L)

B3E ECL E5E4 E5Y

F2G G8

(56) Documents cited

GB 0840752 A

US 4453304 A

US 3916504 A

(58) Field of search

UK CL (Edition L) B3E

INT CL⁵ B21D

Online databases: WPI, CLAIMS

(54) Tool, pipe fittings and a method of securing a pipe of such fittings

(57) A tool (10) for securing a pipe (130) to a pipe fitting (100) comprises a body (12, 14) having an opening for receiving a pipe (130) mounted on a pipe fitting (100), a grooving wheel (40) rotatably mounted on the body and projecting into the opening to engage the pipe (130), a movable carriage carrying two rollers (62) for supporting the pipe, and flanges (36, 80) formed on the tool positioned to engage a formation on the pipe fitting so as to correctly locate the pipe and pipe fitting in the tool. The tool is rotated to form circumferential grooves in the pipe which align with corresponding grooves made at the same time or previously in the pipe fitting.

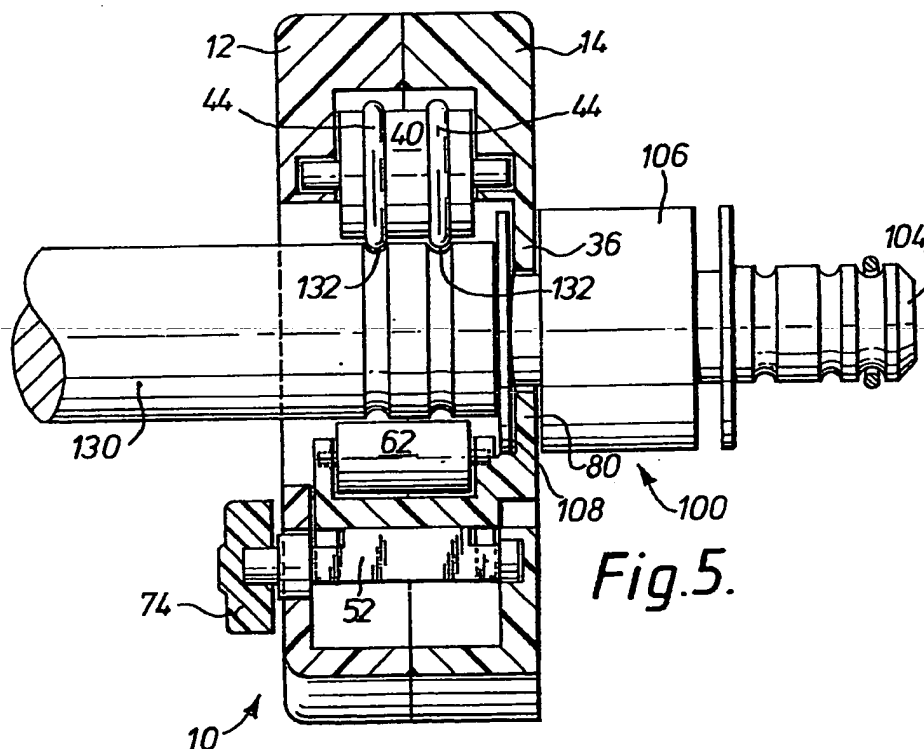
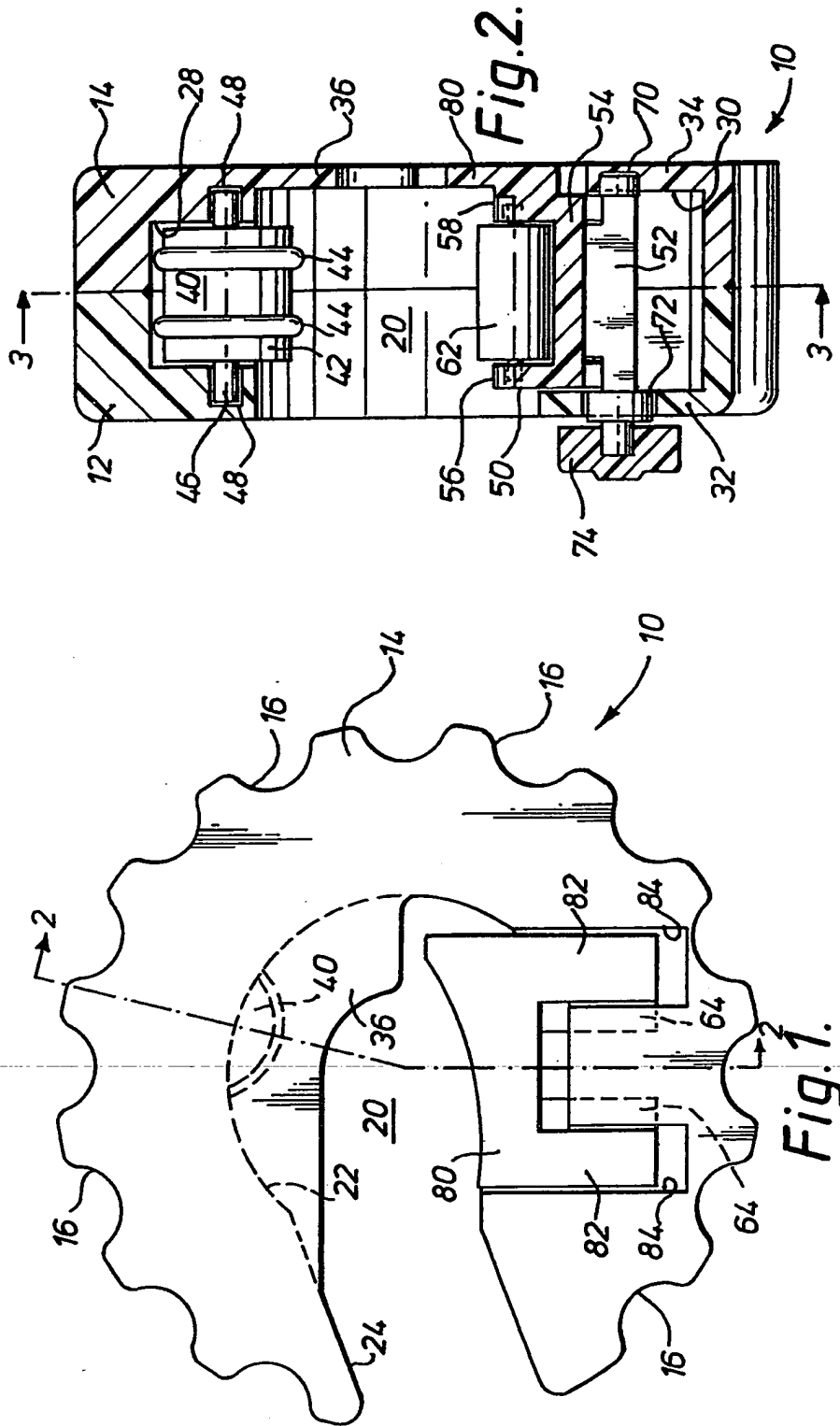


Fig.5.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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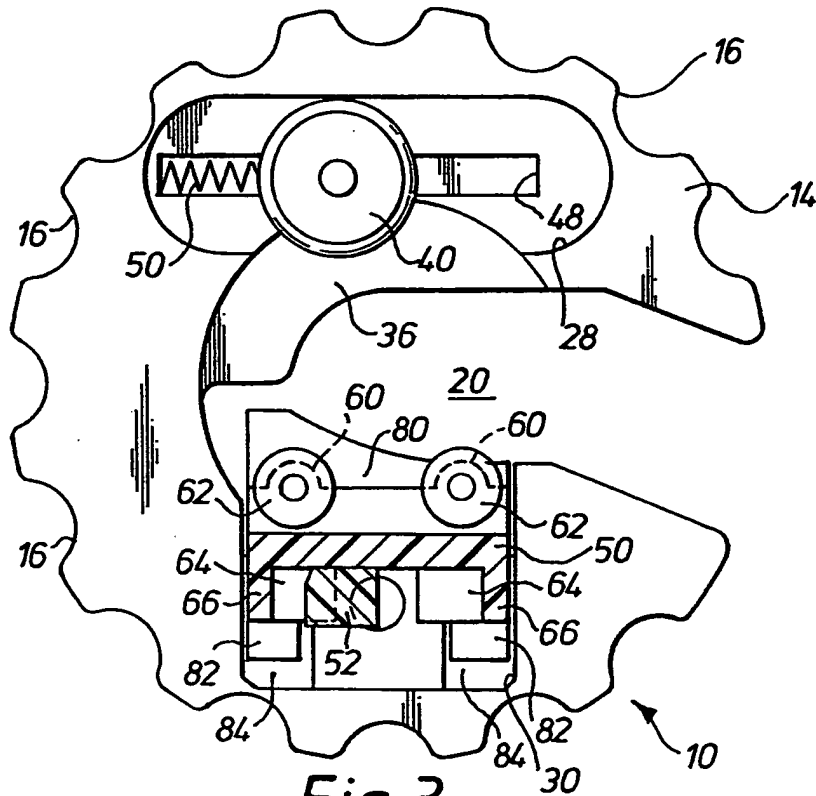


Fig. 3.

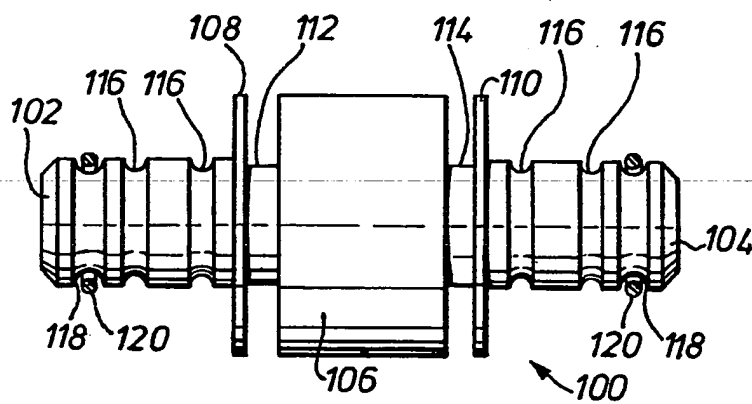
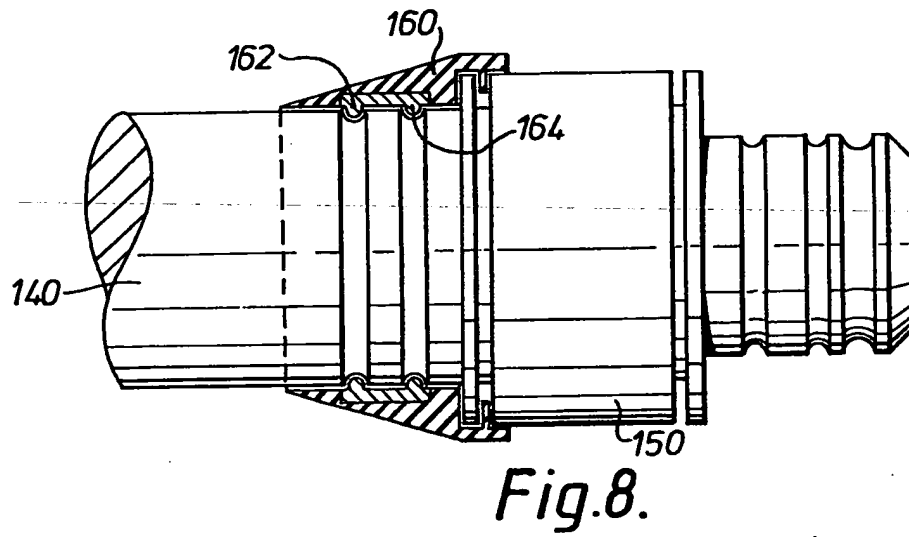
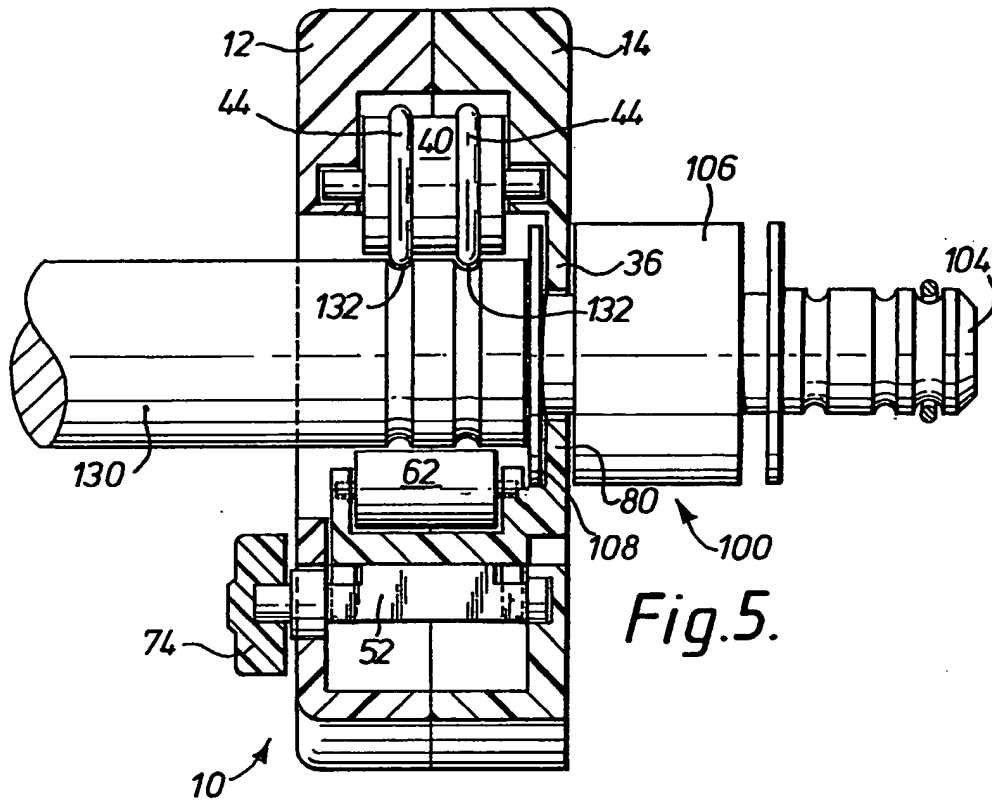


Fig. 4.



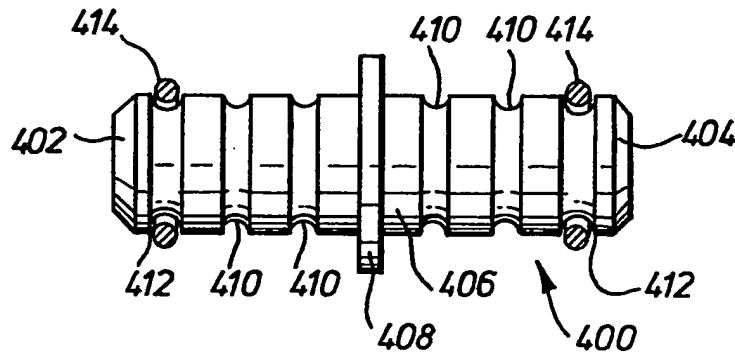


Fig. 6.

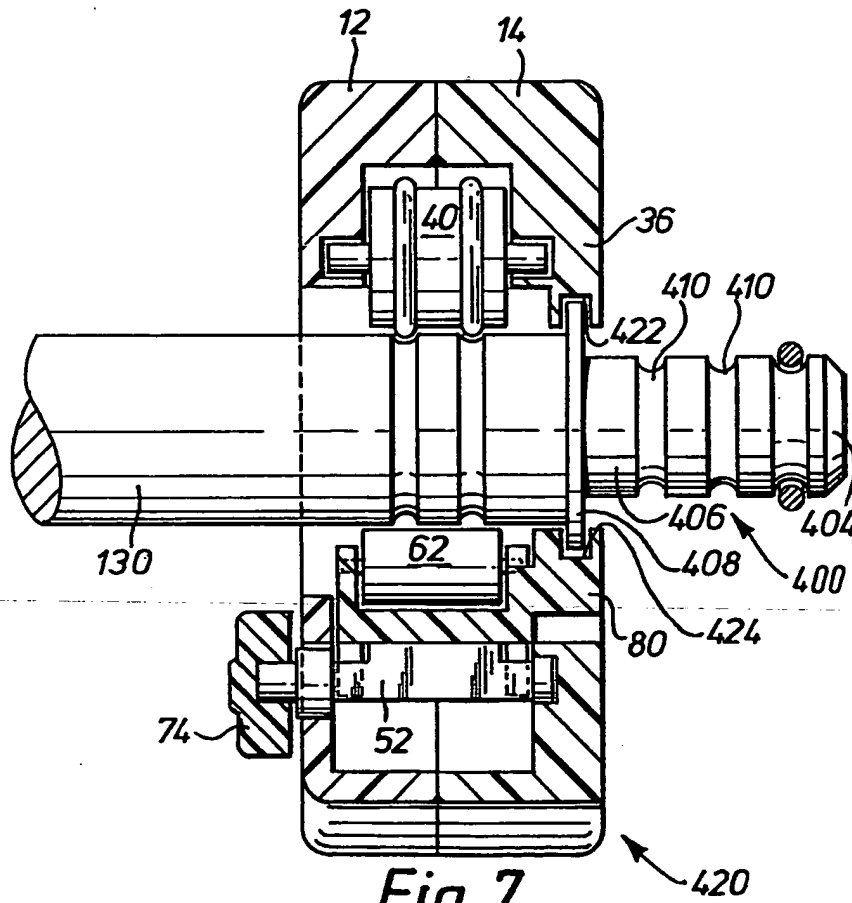


Fig. 7.

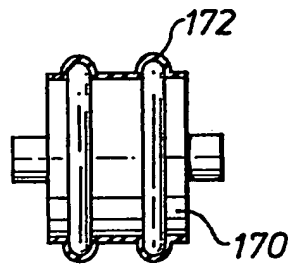


Fig. 9.

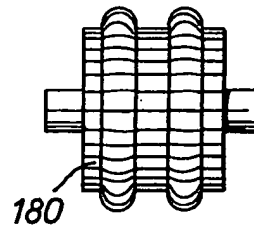


Fig. 10.

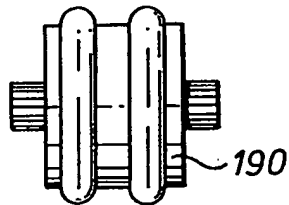


Fig. 11.

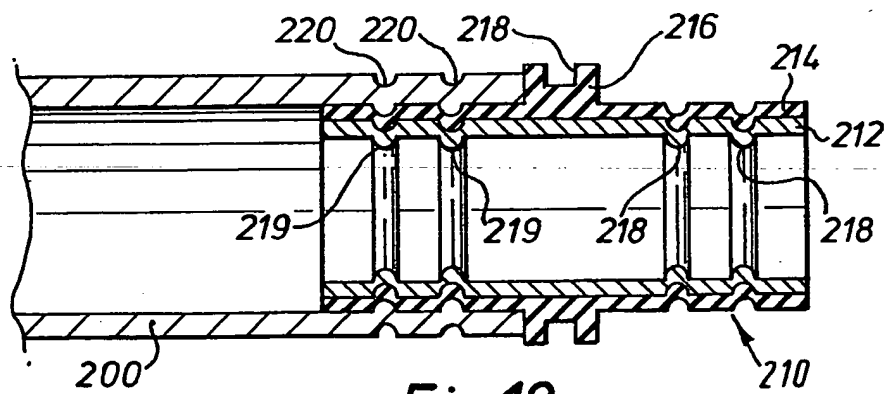


Fig. 12.

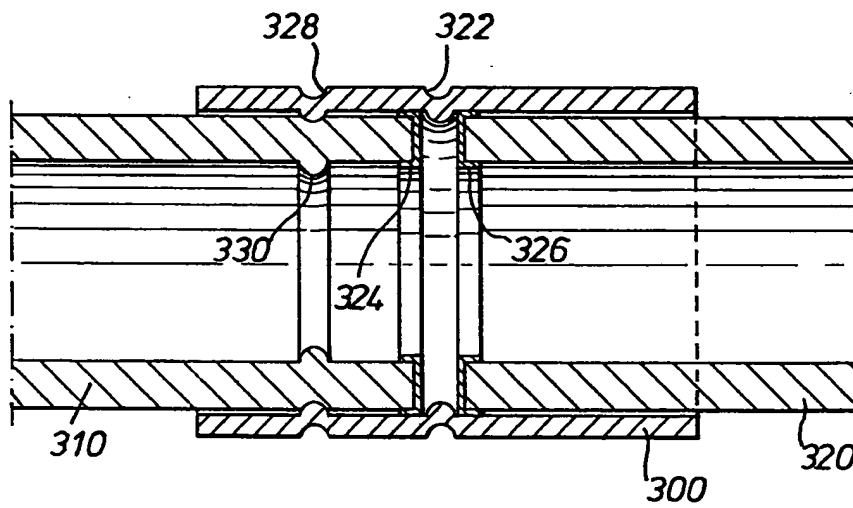


Fig.13.

TOOL, PIPE FITTINGS AND METHOD OF SECURING A PIPE TO SUCH FITTINGS

5 This invention relates to a tool for, and a method of, securing a pipe to a pipe fitting and also to a pipe fitting.

10 In one method of securing a pipe to a pipe fitting, the pipe is placed over the pipe fitting and the pipe and fitting are secured together with a special crimping tool. This method suffers from the disadvantage that the crimping tool is bulky and expensive.

15 Accordingly, it is one object of this invention to provide a new or improved tool for, and a method of, securing a pipe to a pipe fitting, and it is another object of this invention to provide a new or improved pipe fitting.

20 According to one aspect of this invention, there is provided a tool for securing a pipe to a pipe fitting, said tool comprising a body having an opening for receiving a combined assembly of a pipe mounted on or in a pipe fitting, a grooving wheel rotatably mounted on the body and projecting into said opening, means provided on the body for supporting said combined assembly, and means
25 for locating the tool relative to the pipe fitting.

In one embodiment of this invention, the locating means is arranged to engage a groove formed on the pipe fitting.

30 In another embodiment of this invention, the locating means is arranged to engage a flange formed on the pipe fitting.

Preferably, the locating means comprises a flange provided on the body and projecting into said opening.

35 With the other embodiment of this invention, the flange is grooved.

Preferably, the supporting means comprises a carriage slidably mounted on the body, means for engaging said combined assembly provided on the carriage and means for adjusting the position of the carriage relative to the body, and the locating means further includes a second flange projecting into said opening, said second flange being provided on the carriage and aligned with and opposing the flange provided on the body.

With the other embodiment of this invention, the second flange is grooved.

The engaging means may comprise a pair of support rollers rotatably mounted on the carriage.

The grooving wheel may have a pair of circumferential groove forming beads.

Conveniently, the grooving wheel has an axle, the ends of which are mounted in a pair of opposed elongate slots formed in the body.

The outer surface of the grooving wheel may be covered with rubber or it may be knurled. The axle may also be knurled.

According to a second aspect of this invention, there is provided a method of securing an end part of a pipe to an end part of a pipe fitting, said method comprising the steps of placing one of the end parts over the other of the end part so that the end parts become an outer end part and an inner end part, and forming at least one circumferential groove in the outer end part so as to secure the end parts together.

Conveniently, prior to placing the outer end part over the inner end part, at least one circumferential groove is formed in the inner end part.

The end part of the pipe may be the outer end part.

According to a third aspect of this invention, there is provided a pipe fitting having an end part, at

least one circumferential groove being formed in the end part, said at least one circumferential groove being arranged to engage, in use, the inner surface of a groove formed in the end of a pipe.

5 This invention will now be described in more detail, by way of example, with reference to the drawings in which:

 Figure 1 is an end view of a tool for securing a pipe to a pipe fitting;

10 Figure 2 is a longitudinal sectional view of the tool taken on the line 2-2 of Figure 1;

 Figure 3 is a cross-sectional view of the tool taken on the line 3-3 of Figure 2;

 Figure 4 is an elevational view of a pipe fitting which may be secured to a pipe using the tool shown in Figure 1;

 Figure 5 is an elevational view of a pipe being secured to the pipe fitting of Figure 4 using the tool of Figure 1, the tool being shown in section;

20 Figure 6 is an elevational view of a modified pipe fitting;

 Figure 7 is an elevational view of a pipe being secured to the pipe fitting of Figure 6 using a modified tool;

25 Figure 8 is an elevational view of a pipe secured to the pipe fitting of Figure 4 together with an outer seal which is shown in section;

 Figures 9, 10 and 11 are elevational views of three alternative grooving wheels for use in the tool in Figure 1;

30 Figure 12 is a longitudinal sectional view of another pipe fitting which has been secured to a pipe using the tool of Figure 1; and

 Figure 13 is a longitudinal view of a further pipe fitting which has been secured to a pipe using the

35

tool of Figure 1.

Referring now to Figures 1 to 3, there is shown a grooving tool 10 comprising a pair of generally cylindrical body parts 12, 14. The outer surfaces of the body parts 12, 14 are provided with a series of circular recesses, some of which are denoted by reference numeral 16, to enable the user to get a good grip on the tool. The body parts 12, 14 have an opening 20 which has a section 22 of circular cross-section at the centre of body parts 12, 14 and a parallel sided section 24 between the central section 12 and the outside surfaces of body parts 12, 14.

At their mating surfaces, recesses 28, 30 are formed in body parts 12, 14. As shown in Figure 3, the recess 28 has an oval shape in cross-section and the recess 30 is parallel sided. As will be explained below, the recesses 28, 30 house components of the tool 10. Between the recess 30 and their outside surfaces, body parts 12, 14 have wall parts 32, 34. Adjacent its right hand surface as viewed in Figure 2, the body part 14 has a flange 36 which extends into opening 20.

In the present example, the body parts 12, 14 are made from a plastics material but these part may also be made from a metal such as steel.

A grooving wheel 40 is housed in the recess 28. The grooving wheel 40 has a cylindrical body part 42 having a pair of circumferential beads 44 mounted on an axle 46. In the example shown in Figures 1 to 3, the grooving wheel 40 is formed integrally from steel. The ends of the axle 46 are received in a pair of elongate straight slots 48 formed in body parts 12, 14. Each of the slots 48 contains a spring 50 which is located between one end of the slot and the end of axle 46. As viewed in Figure 3, the springs 50 urge the grooving wheel 40 to the right.

The recess 30 houses a carriage 50 and a cam member 52. The carriage 50 can slide radially in the recess 30. The carriage 50 has a central plate 54 and a pair of side plates 56, 58. Along their upper surfaces, as viewed in Figures 1 to 3, the side plates 56, 58 are provided with arches 60, which are shown by dotted lines in Figure 3. A pair of support rollers 62 are mounted on carriage 50 between the arches 60. The axes of the rollers 62 together with the axis of grooving wheel 40 lie approximately at the apices of an isosceles triangle. As will be described below, in use, a pipe or other tubular member is supported by the rollers 62 so as to be held between rollers 62 and the grooving wheel 40. As shown in dotted lines in Figure 1 and solid lines in Figure 3, the lower part of each of the side plates 56, 58 is provided with a pair of legs 64. Beneath the central plate 54, the side plates 56 and 58 are joined by a further pair of plates 66.

In cross-section, the central part of cam 52 has a rectangular shape and its ends have a circular shape. The right hand end of cam 52 is received in a bore 70 in the wall part 34 of body part 14 and the left hand end of cam 52 passes through a bore 72 in the wall part 32 of body part 12 and is engaged by a knob 74. The central part of cam 52 engages the lower surface of the central plate part 54 of carriage 50. By rotating the knob 74, the position of carriage 50 may be adjusted. In operation, the knob 74 is rotated so as to set the position of support rollers 62 for the diameter of the pipe or pipe fitting on which the tool 10 is to operate. Thus, the tool 10 can operate on pipes or pipe fittings having four different diameters. For convenience, these diameters may be marked at 90° intervals around the outer surface of knob 74 and an alignment mark may be formed on the outer surface of wall part 32 adjacent knob 74. By

way of modification, the central part of cam 52 may have a hexagonal shape in cross-section, thereby permitting carriage 50 to be set at six different positions.

5 By way of another modification, the central part of cam 52 may have a continuous profile and its position may be controlled by a ratchet mechanism.

The carriage 50 also has a flange 80 adjacent to, and formed integrally with, its side plate 58. The flange 80 projects inwardly into aperture 20 and is aligned with, and opposed to, the flange 36. As shown in Figures 1 and 3, the upper surface of flange 80 is curved. Also as shown in Figures 1 and 3, the lower part of flange 80 has a pair of legs 82 which are received in a pair of cut-outs 84 formed in the wall part 34 of body part 14. As will be explained below, the flanges 36 and 80 together locate the position of tool 10 relative to a pipe fitting. As the knob 74 is rotated to set the position of rollers 62, the spacing between the inner edges of flanges 36 and 80 will also be adjusted.

Although the position of carriage 50 is adjusted in the example shown in Figures 1 to 3 by the cam 52, other mechanisms may, by way of alternative, be provided for adjusting its position. For example, in place of cam 52, there may be provided a screw which passes through the lower surface of one of the body parts 12, 14 and engages the lower surface of the central plate part 54. Where the tool 10 is required for use with a pipe or pipe fitting of only one diameter, carriage 50 may be replaced by a non-adjustable member for holding the support rollers 62 and the flange 80 may then be formed integrally with the body part 14.

Referring now to Figure 4, there is shown a pipe fitting 100 which may be secured to the ends of a pair of pipes using the tool 10 of Figures 1 to 3. The pipe

fitting 100 has a pair of tubular end parts 102, 104 for receiving the ends of a pair of pipes, a central cylindrical part 106 and flanges 108, 110 located on opposite sides of the body part 106. The flanges 108, 110 together with the body part 106 define location grooves 112, 114. The end parts 102, 104 and the body part 106 have bores of equal diameter. In each of the end parts 102, 104 there is provided a pair of circumferential grooves 116. Adjacent their outer ends, each of the end parts 102, 104 has a further circumferential groove 118 which receives an O-ring 120.

The O-rings 120 improve the seal between the pipe fitting 100 and the pipes to which it is secured. However, at low pressures, an adequate seal may be achieved without the O-rings 120.

Referring now to Figure 5, there is shown the grooving tool 10 in use securing the end of a pipe 130 to a fitting 100. In the present example, the pipe 130 comprises an aluminium tube laminated between layers of plastic material. This type of pipe is suitable for domestic and industrial plumbing and has the advantages that it is light, strong, flexible, durable, easily bent to the required shape and compatible with most chemicals. However, the present invention is not limited to this type of pipe.

In order to secure the end of pipe 130 to pipe fitting 100, the knob 74 of grooving tool 10 is rotated so that the spacing between support rollers 62 and the grooving wheel 40 is correct for the outside diameter of pipe 130. This operation will also ensure that the flanges 36 and 80 are set at the correct distance apart for the external diameter of groove 112 of pipe fitting 100.

The end of pipe 130 is then placed over the end part 102 of the pipe fitting 10 so that the free end of

pipe 130 engages the outer surface of flange 108. The grooving tool 10 is then placed over the pipe 130 and pipe fitting 100 so that flanges 36 and 80 are received in groove 112 of pipe fitting 100 and the end of pipe 130 is received in the aperture 20. As a result of engaging the flanges 36 and 80 in groove 112, the circumferential beads 44 of grooving wheel 40 will be in accurate alignment with the grooves 116 of pipe fitting 100. As a result of placing the tool 10 over the pipe 130, the grooving wheel 40 will be moved to the left, as shown in Figure 3, against the action of springs 50 so that the circumferential beads 44 engage the outer surface of pipe 130.

Next, the tool 10 is rotated anti-clockwise through several complete revolutions, as viewed in Figure 3. This will cause the grooving wheel 40 to rotate in an anti-clockwise direction, as viewed in Figure 3. Because the axle 46 will be forced into engagement with the outer edges of slots 48, the anti-clockwise rotation of wheel 40 will cause the wheel 40 to be driven to the right as shown in Figure 3, and hence inwardly. As a result of the rotation of tool 10 and the inward movement of the grooving wheel 40, a pair of grooves 132 will be formed in the pipe 130 and the grooves 132 will be pressed into the grooves 116 in the pipe fitting 100. In this manner, the pipe 130 will be secured to the pipe fitting 100.

Referring now to Figure 6, there is shown a pipe fitting 400 which may be secured to the ends of a pair of pipes using the tool 10 modified in a manner to be described. The pipe fitting 400 has a pair of tubular end parts 402, 404 for receiving the ends of a pair of pipes, and a central cylindrical part 406 having a circular flange 408. In each of the end parts 406, there is provided a pair of circumferential grooves 410.

Adjacent their outer ends, each of the end parts 402, 404 has a circumferential groove 412 which receives an O-ring 414.

Referring now to Figure 7, there is shown a grooving tool 420 in use securing the end of a pipe 130 to the fitting 400. The tool 420 is generally similar to the tool 10 and like parts are denoted by the same reference numerals. However, the flanges 36, 80 are provided with grooves 422, 424 for engaging flange 408.

In each of the tools 10, 420, by way of simplification the flange 80 may be omitted.

Referring now to the Figure 8, there is shown the end of a pipe 140 secured to a pipe fitting 150, which is generally similar to pipe fitting 100, using the grooving tool 10. The pipe 140 has the same construction as the pipe 130. A rubber seal 160 is engaged over the end of pipe 140 and serves to protect the end of pipe 140 from damage, and, where the pipe 140 is buried, from harmful effects caused by water or soil. A steel circlip 162 is embedded in seal 160 and engages grooves 164 formed in pipe 140. The circlip 162 enables the connection between pipe 140 and pipe fitting 150 to withstand high pressures in a liquid or gas flowing through pipe 140.

Referring now to Figures 9 to 11, there are shown three alternative grooving wheels 170, 180, 190 which may be used in the tool 10 in place of the grooving wheel 40. In the grooving wheel 170, the outer surface of the cylindrical part is coated with a layer of rubber 172 which improves the grip of the grooving wheel 170 on the outer surface of a pipe. In the grooving wheel 180, the outer surface of the central part is knurled and this also improves the grip between the grooving wheel 180 and the outer surface of a pipe. In the grooving wheel 190, the outer surface of the axle is knurled and this improves the grip between the axle of wheel 190 and the

outer edges of slots 48 and this in turn has the effect of improving the grip between the grooving wheel 190 and the outer surface of a pipe or pipe fitting.

5 Although the grooving wheels 40, 170, 180 and 190 each have a pair of circumferential beads, it is not essential to have two beads. By way of modification, the grooving wheel may have a single circumferential bead or three circumferential beads arranged in parallel with each other.

10 Although in the grooving tool shown in Figures 1 to 3, the axle 48 of grooving wheel 40 is mounted in a pair of slots formed in the body parts 12, 14, this is not the only way of mounting the grooving wheel. By way of alternative, the grooving wheel may be provided with
15 an eccentric axle received in bores in body parts 12, 14.

Referring now to Figure 12, there is shown a pipe 200 secured to a pipe fitting 210 by using the grooving tool 10. The pipe 200 is of the same construction as pipe 130. The pipe fitting 210 comprises a length of
20 tube 212 formed from copper or other metal and coated with a layer of rubber 214 or other suitable material. The coating of rubber 214 has a central boss 216 in which a location groove 218 is formed for receiving the flanges 36 and 80 of grooving tool 10. Grooves 219 may be
25 formed in the tube 212 and rubber coating 214 prior to securing the pipe 200 to fitting 210. As a result of operating the tool 10, grooves 220 are formed in the end of pipe 200 and these serve to lock the tube 200 to pipe fitting 210. If grooves 219 are not formed in the tube
30 212 and rubber coating 214 prior to securing the pipe 200 to fitting 210, these grooves will be formed by tool 10 together with grooves 220. The central boss 216 of pipe fitting 210 serves to seal the end of pipe 200. The pipe fitting 210 has the advantage that it is simple and
35 cheap to manufacture.

Referring now to Figure 13, there is shown a pipe fitting 300 connecting the ends of a pair of pipes 310 and 320 together. In Figure 13, the fitting 300 is shown already secured to the pipe 310 but it is not yet secured to the pipe 320.

The fitting 300 comprises a length of pipe made from copper, other metals or other suitable material. Before connecting the pipes 310, 320 to the fitting 300, a groove 322 is formed in the centre of fitting 300. The groove 322 does not have to be formed by the person installing the fitting as it may be pre-formed during manufacture of the fitting 300. Then, rubber rings 324, 326 are placed, respectively, over the ends of pipes 310, 320. In order to improve the rigidity, the rubber rings 324, 326 may be encapsulated in plastics material except for their outer limbs. Encapsulation in plastics material improves rigidity of the rings and consequently the effectiveness with which they seal the ends of pipes 310, 320. The pipes 310, 320 have the same construction as pipe 130 in Figure 5 and it is desirable to seal the ends of such pipes in order to prevent delamination of the layers of the pipe.

The pipes 310, 320 are then pushed into the ends of fitting 300, as shown in Figure 13, until they engage the inner surface of the groove 322 of pipe fitting 300. The grooving tool 10 is then placed over the end of pipe 310 and the corresponding end of pipe fitting 300 so that the flanges 36, 80 engage the groove 322. The tool 10 is then rotated several times so as to form a groove 328 in pipe fitting 300 and a groove 330 in pipe 310. The formation of grooves 328, 330 ensure that the pipe 310 is secured to pipe fitting 300. Although not shown in Figure 13, the tool 10 is then placed over the end of pipe 320 and the corresponding end of pipe fitting 300 with the flanges 36, 80 again engaging groove 322. The

tool 10 is then rotated several times to form grooves both in pipe fitting 300 and the end of pipe 320.

5 The pipe fitting 300 shown in Figure 13 has the advantage that it is engaged with the outside surfaces of pipes 310 and 320 and so there is no reduction in the bore presented to a fluid flowing through the pipes.

CLAIMS

1. A tool for securing a pipe to a pipe fitting, said tool comprising a body having an opening for receiving a combined assembly of a pipe mounted on or in a pipe fitting, a grooving wheel rotatably mounted on the body and projecting into said opening, means provided on the body for supporting said combined assembly, and means for locating the tool relative to the pipe fitting.
2. A tool as claimed in Claim 1, wherein the locating means is arranged to engage a groove formed on the pipe fitting.
3. A tool as claimed in Claim 1, wherein the locating means is arranged to engage a flange formed on the pipe fitting.
4. A tool as claimed in any preceding claim, wherein the locating means comprises a flange provided on the body and projecting into said opening.
5. A tool as claimed in Claim 4, wherein the flanged provided on the body is grooved.
6. A tool as claimed in any preceding claim, wherein the supporting means comprises a carriage slidably mounted on the body, means for engaging said combined assembly provided on the carriage and means for adjusting the position of the carriage relative to the body, and the locating means further includes a second flange projecting into said opening, said second flange being provided on the carriage and aligned with and opposing the flange provided on the body.
7. A tool as claimed in Claim 6, wherein the second flange is grooved.
8. A tool as claimed in Claim 6, wherein the engaging means comprises a pair of support rollers rotatably mounted on the carriage.
9. A tool as claimed in any preceding claim, wherein the grooving wheel has a pair of circumferential

groove forming beads.

10. A method of securing an end part of a pipe to an end part of a pipe fitting, said method comprising the steps of placing one of the end parts over the other
5 of the end parts so that the end parts become an outer end part and an inner end part, and forming at least one circumferential groove in the outer end part so as to secure the end parts together.
11. The method as claimed in Claim 10, wherein prior
10 to placing the outer end part over the inner end part, at least one circumferential groove is formed in the inner end part.
12. A pipe fitting having an end part, at least one circumferential groove being formed in the end part, said
15 at least one circumferential groove being arranged to engage, in use, the inner surface of a groove formed in the end of a pipe.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number

GB 9214683.6

Relevant Technical fields

(i) UK Cl (Edition L) B3E

(ii) Int Cl (Edition 5) B21D

Databases (see over)

(i) UK Patent Office

(ii) **ONLINE DATABASES: WPI, CLAIMS**

Search Examiner

A R MARTIN

Date of Search

23 JULY 1993

Documents considered relevant following a search in respect of claims

| Category (see over) | Identity of document and relevant passages | Relevant to claim(s) |
|------------------------|--|---------------------------------|
| X | GB 840752 (KEMP) - see Figures 3 and 6 | Claims 1, 10, 12 at least |
| X | US 4453304 (ATOMIC ENERGY OF CANADA) - see Figure 3 | Claims 1, 10, 12 at least |
| X | US 3916504 (UNIVERSAL OIL) - see Figure 3 | Claims 1, 10, 12 at least |
| | | |

| Category | Identity of document and relevant passages | Relevant to claim(s) |
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